



HannStar Display Corp.

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| Document Title | HSD220MKW1- A Formal Product Information | Page No. | 1 / 26 |
| Document No. | | Revision | 1.0 |

Date: 4 Mar. 2008

HannStar Product Information

Model: **HSD220MKW1**
- A**

Note:

1. Please contact Hannstar Display Corp. before designing your product based on this module specification.
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by Hannstar for any intellectual property claims or other problems that may result from application based on the module described herein.
3. The mark “ ** ” of Model means sub-model code.

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Record of Revisions

| Rev. | Updated No. | Date | Description of change |
|------|-------------|--------------|---|
| 1.0 | A00 | Mar. 4, 2008 | HSD220MKW1-A Formal Product Information was first issued. |

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1.0 GENERAL DESCRIPTIONS

1.1 Introduction

HannStar Display model **HSD220MKW1-A** is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, the voltage reference, common voltage, DC-DC converter, column, and row driver circuit. This TFT LCD has a 22-inch diagonally measured active display area with WSXGA+ resolution (1050 vertical by 1680 horizontal pixel array).

1.2 Features

- 22" WSXGA+ TN mode TFT LCD panel
- High speed response time
- 4 CCFL Backlight system
- Supported WSXGA+ (V: 1050 lines, H: 1680 pixels) resolution
- Supported 75Hz refresh rate
- With LCD Timing Controller
- RoHS compatible

1.3 General information

| Item | Specification | | Unit |
|-------------------|---------------------------------|-----------------------|--------|
| Outline dimension | 493.7x320.1x16.5 (typ.) | | mm |
| Display area | 473.76 (H) x296.16 (V) | | mm |
| Number of Pixel | 1680(H) x 1050(V) | | Pixels |
| Pixel pitch | 0.282(H) x 0.282(V) | | mm |
| Pixel arrangement | RGB Vertical stripe | | |
| Display color | 16.7M (6-bit+HiFRC) | | |
| Display mode | Normally white | | |
| Surface treatment | Antiglare (3H) | | |
| Weight | 2600 | | G |
| Back-light | 4-CCFLs, Top & bottom edge side | | |
| Input signal | 2-ch LVDS | | |
| Power consumption | Logic system | 4.2 @ v-color pattern | W |
| | B/L system | 5.48 | W |

1.4 Applications

- Desktop and Multi-function monitors
- Display terminals for AV applications
- Monitors for industrial applications



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1.5 Mechanical Information

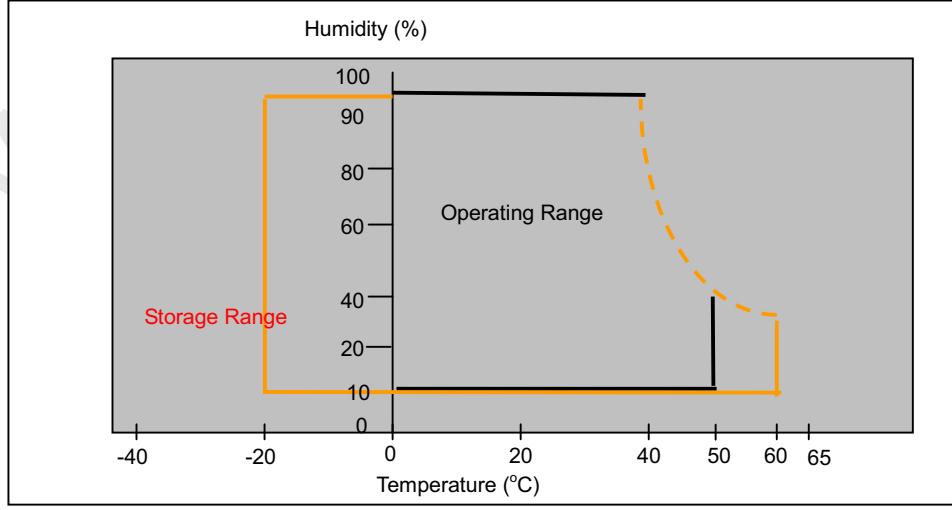
| Item | Min. | Typ. | Max. | Unit |
|-------------------------------|---------------|-------|-------|----------|
| Module Size | Horizontal(H) | 493.2 | 493.7 | 494.2 mm |
| | Vertical(V) | 319.6 | 320.1 | 320.6 mm |
| | Depth(D) | 16.0 | 16.5 | 17.0 mm |
| Weight (without inverter) | 2400 | 2600 | 2800 | g |
| Torque of customer screw hole | | | 3.0 | Kgf*Cm |

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Rating of Environment

| Item | Symbol | Min. | Max. | Unit | Note |
|------------------------------|------------|------|------|------|------|
| Storage temperature | T_{STG} | -20 | 60 | °C | |
| Operating temperature | T_{OPR} | 0 | 50 | °C | (1) |
| Vibration (non-operating) | V_{NOP} | -- | 1.5 | G | (2) |
| Shock (non-operating) | S_{NOP} | -- | 70 | G | (3) |
| Storage humidity | H_{STG} | 10 | 90 | %RH | (3) |
| Operating humidity | H_{OP} | 10 | 80 | %RH | (4) |
| Low pressure (operating) | P_{LOP} | 697 | -- | HPa | (5) |
| Low pressure (non-operating) | P_{LNOP} | 116 | -- | HPa | (6) |

Note (1) Storage /Operating temperature



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- (2) 10-500Hz sine wave, X, Y, Z each directions, 30min/cycle.
- (3) 11ms, $\pm X$, $\pm Y$, $\pm Z$ direction, one time each. For this shock test, It is necessary to fill the silicon rubber between the shock jigs as buffer.
- (4) Max wet bulb temp. =39°C
- (5) 2 hrs. (10000 feet)
- (6) 24hrs. (50000 feet)

2.2 Electrical Absolute Rating:

2.2.1 TFT LCD Module:

| Item | Symbol | Min. | Max. | Unit. | Note |
|----------------------|--------|------|------|-------|--------|
| Power supply Voltage | VDD | -0.3 | 6.0 | V(DC) | (1)(2) |

2.2.2 Back Light Unit:

| Item | Symbol | Min. | Max. | Unit | Note |
|----------------|--------|------|------|------|-----------|
| Lamp current | I_L | 3.0 | 9.0 | mA | (1)(2)(3) |
| Lamp frequency | f_L | 40 | 80 | KHz | (1)(2)(3) |

Note: (1) Permanent damage may occur to the LCD module if beyond this specification.

Functional operation should be restricted to the conditions described under Normal Operating Conditions.

- (2) To exceed 7.5mA, life time accelerate drop down and if to exceed 9.0 mA has safety problem. If current lower than 3.5 mA, CCFL would be unstable or damaged.
- (3) Within $T_a=25\pm2^\circ C$



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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---------------------------------------|-----------|--|-------|-------|-------|-------------------|-------------------------|
| Contrast | CR | $\Theta = 0^\circ$ $\phi = 0^\circ$ Normal viewing angle | 700 | 1000 | -- | | (1)(2) |
| Response time | Rising | | -- | 1.5 | 3 | msec | (1)(3) |
| | Falling | | -- | 3.5 | 7 | | |
| White luminance (center of screen) | Y_L | | 240 | 300 | | cd/m ² | (1)(4)(7) (IL=7.5mA) |
| Color chromaticity (CIE1931) | Red | Rx | 0.615 | 0.645 | 0.675 | | (1)(5) |
| | | Ry | 0.310 | 0.340 | 0.370 | | |
| | Green | Gx | 0.270 | 0.300 | 0.330 | | |
| | | Gy | 0.600 | 0.630 | 0.660 | | |
| | Blue | Bx | 0.110 | 0.140 | 0.170 | | |
| | | By | 0.035 | 0.065 | 0.095 | | |
| | White | Wx | 0.280 | 0.310 | 0.340 | | |
| | | Wy | 0.300 | 0.330 | 0.360 | | |
| Viewing angle | Hor. | Θ_L | 80 | 85 | -- | | |
| | | Θ_R | 80 | 85 | -- | | |
| | Ver. | Θ_H | 75 | 80 | -- | | |
| | | Θ_L | 75 | 80 | -- | | |
| Viewing angle | Hor. | Θ_L | 80 | 85 | -- | | |
| | | Θ_R | 80 | 85 | -- | | |
| | Ver. | Θ_H | 80 | 85 | -- | | |
| | | Θ_L | 80 | 85 | -- | | |
| Brightness uniformity | B_{UNI} | $\Theta = 0^\circ$ $\phi = 0^\circ$ | 75 | -- | -- | % | (6) |

3.2 Measuring Condition

- Measuring surrounding: dark room
- Lamp current I_{BL} : $(7.5) \pm 0.1$ mA, lamp freq. F_L = 50KHz, Inverter: TDK TBD332LR
- V_{DD1} =5.0V, f_V =60Hz, f_{DCLK} =59.61MHz
- Surrounding temperature: $25 \pm 2^\circ\text{C}$
- 30min. Warm-up time.

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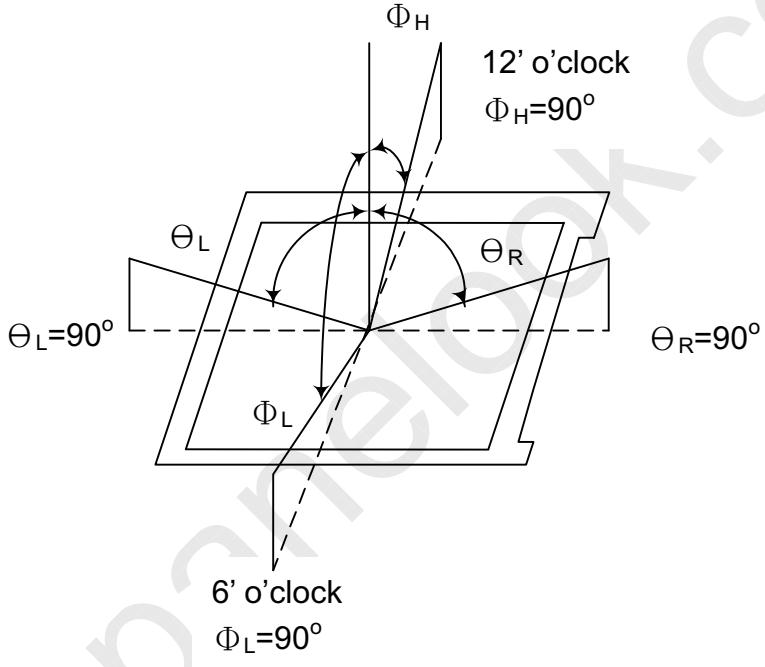
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3.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size: 20~21mm

Note (1) Definition of Viewing Angle:



Note (2) Definition of Contrast Ratio (CR):

measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white (L255)}}{\text{Luminance with all pixels black (L0)}}$$

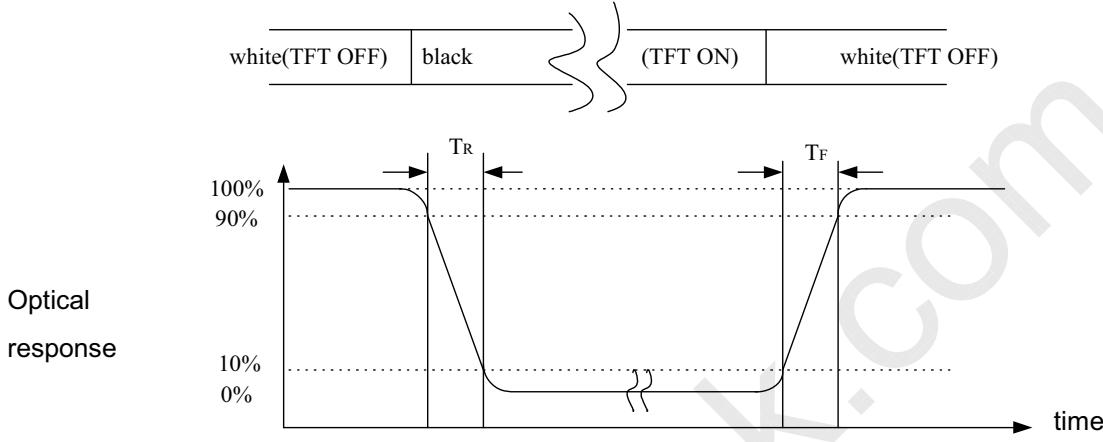
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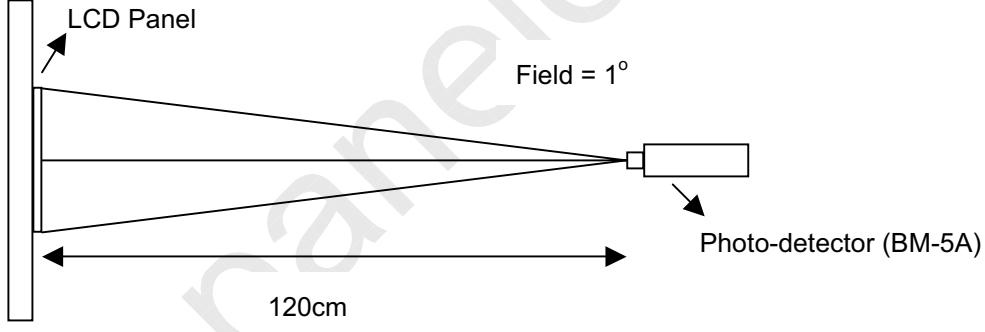
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Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Optical characteristic measurement setup



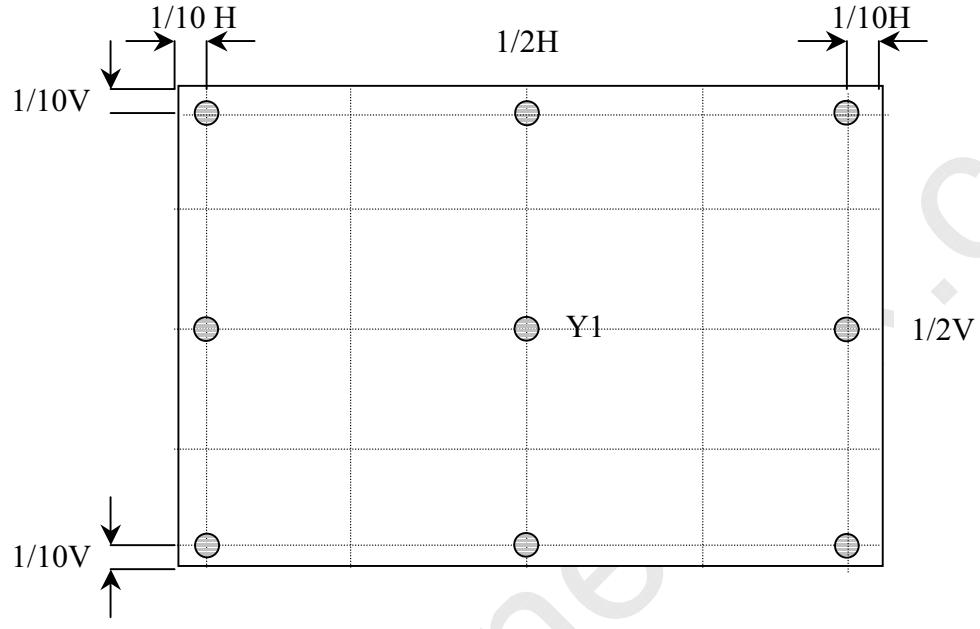
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Note (5) Definition of Center Luminance of White

Center Luminance= Y_1 

Note (6) Definition of brightness uniformity

(Min Luminance of 9 points)

$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

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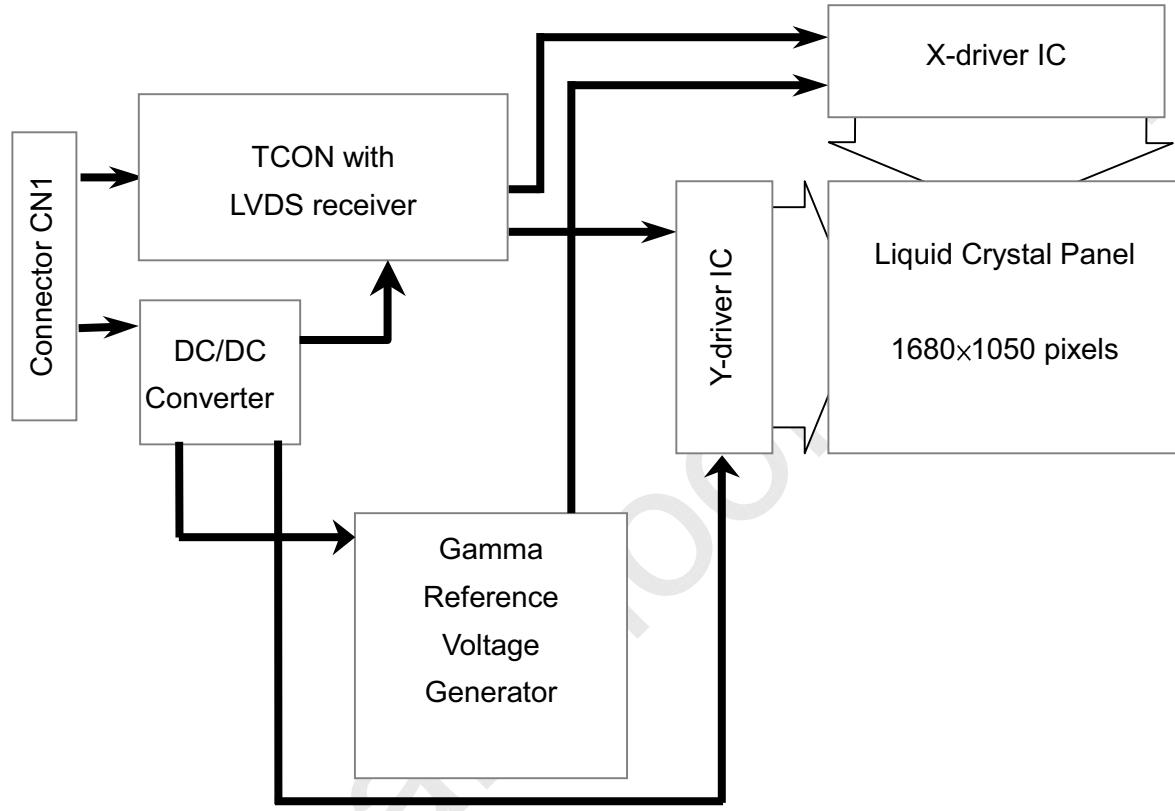


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4.0 BLOCK DIAGRAM

4.1 LCD Module Block Diagram:



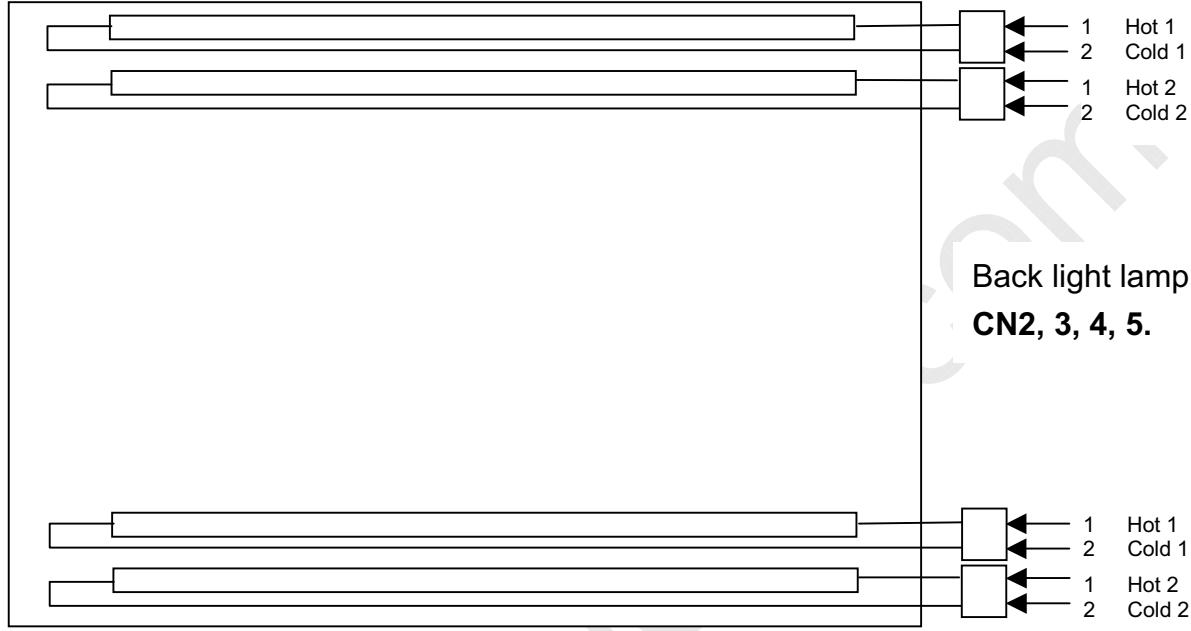
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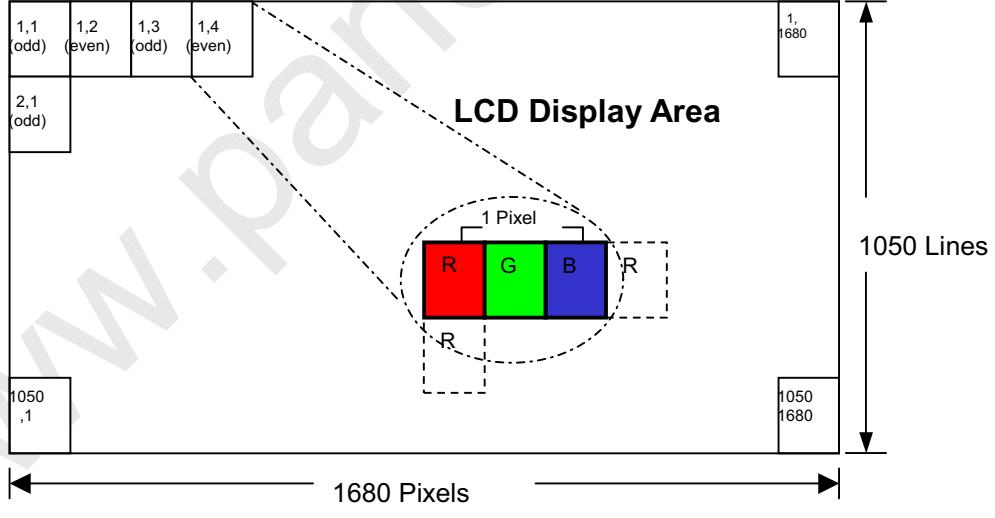
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4.2 Back Light Unit



4.3 Pixel Format



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4.4 Relationship Between Displayed Color and Input

| | Display | MSB R7 R6 R5 R4 R3 R2 R1 R0 | LSB | MSB G7 G6 G5 G4 G3 G2 G1 G0 | LSB | MSB B7 B6 B5 B4 B3 B2 B1 B0 | LSB | Gray scale Level |
|-----------------------------|-------------------------|--------------------------------|-------------------|--------------------------------|-------------------|--------------------------------|-------------------|---------------------|
| Basic color | Black | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | - |
| | Blue | L L L L L L L L | L L L L L L L L | H H H H H H H H | H H H H H H H H | H H H H H H H H | H H H H H H H H | - |
| | Green | L L L L L L L L | H H H H H H H H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | - |
| | Light Blue | L L L L L L L L | H H H H H H H H | H H H H H H H H | H H H H H H H H | H H H H H H H H | H H H H H H H H | - |
| | Red | H H H H H H H H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | - |
| | Purple | H H H H H H H H | L L L L L L L L | H H H H H H H H | H H H H H H H H | H H H H H H H H | H H H H H H H H | - |
| | Yellow | H H H H H H H H | H H H H H H H H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | - |
| | White | H H H H H H H H | H H H H H H H H | H H H H H H H H | H H H H H H H H | H H H H H H H H | H H H H H H H H | - |
| Gray scale of Red | Black | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L0 |
| | Dark ↑ ↓ Light | L L L L L L L H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L1 |
| | | L L L L L L H L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L2 |
| | | : | : | : | : | : | : | L3…L251 |
| | | H H H H H H L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | | H H H H H H L H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | | H H H H H H H L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | Red | H H H H H H H H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | Red L255 |
| Gray scale of Green | Black | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L0 |
| | Dark ↑ ↓ Light | L L L L L L L L | L L L L L L L H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L1 |
| | | L L L L L L L L | L L L L L L L H L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L2 |
| | | : | : | : | : | : | : | L3…L251 |
| | | L L L L L L L L | H H H H H H L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | | L L L L L L L L | H H H H H H L H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | | L L L L L L L L | H H H H H H H L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | Green | L L L L L L L L | H H H H H H H H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | Green L255 |
| Gray scale of Blue | Black | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L0 |
| | Dark ↑ ↓ Light | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L H | L L L L L L L L | L L L L L L L L | L1 |
| | | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L H L | L L L L L L L L | L L L L L L L L | L2 |
| | | : | : | : | : | : | : | L3…L251 |
| | | L L L L L L L L | L L L L L L L L | L H H H H H H L L | L H H H H H H L L | L L L L L L L L | L L L L L L L L | L255 |
| | | L L L L L L L L | L L L L L L L L | H H H H H H H L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | | L L L L L L L L | L L L L L L L L | H H H H H H H H | L L L L L L L L | L L L L L L L L | L L L L L L L L | L255 |
| | Blue | L L L L L L L L | L L L L L L L L | H H H H H H H H | H H H H H H H H | L L L L L L L L | L L L L L L L L | Blue L255 |
| Gray scale of White & Black | Black | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L L L L L L L L | L0 |
| | Dark ↑ ↓ Light | L L L L L L L H | L L L L L L L L | L L L L L L L H | L L L L L L L L | L L L L L L L H | L L L L L L L H | L1 |
| | | L L L L L L L H L | L L L L L L L H L | L L L L L L L H L | L L L L L L L H L | L L L L L L L H L | L L L L L L L H L | L2 |
| | | : | : | : | : | : | : | L3…L251 |
| | | H H H H H H H L L | H H H H H H H L L | H H H H H H H L L | H H H H H H H L L | H H H H H H H L L | H H H H H H H L L | L252 |
| | | H H H H H H H L H | H H H H H H H L H | H H H H H H H L H | H H H H H H H L H | H H H H H H H L H | H H H H H H H L H | L253 |
| | | H H H H H H H H L | H H H H H H H H L | H H H H H H H H L | H H H H H H H H L | H H H H H H H H L | H H H H H H H H L | L254 |
| | White | H H H H H H H H H | H H H H H H H H H | H H H H H H H H H | H H H H H H H H H | H H H H H H H H H | H H H H H H H H H | White L255 |

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5.0 I/O CONNECTION PIN ASSIGNMENT

5.1 Interface Connector (30-pins) (HRS: MDF76GW-30S-1H or equivalent)

| Pin No. | Signal | Description |
|---------|--------|----------------------------|
| 1 | RinO0- | Receiver Signal (-) |
| 2 | RinO0+ | Receiver Signal (+) |
| 3 | RinO1- | Receiver Signal (-) |
| 4 | RinO1+ | Receiver Signal (+) |
| 5 | RinO2- | Receiver Signal (-) |
| 6 | RinO2+ | Receiver Signal (+) |
| 7 | VSS | Ground |
| 8 | RinOC- | Clock Signal (-) |
| 9 | RinOC+ | Clock Signal (+) |
| 10 | RinO3- | Receiver Signal (-) |
| 11 | RinO3+ | Receiver Signal (+) |
| 12 | RinE0- | Receiver Signal (-) |
| 13 | RinE0+ | Receiver Signal (+) |
| 14 | VSS | Receiver Signal (+) |
| 15 | RinE1- | Receiver Signal (-) |
| 16 | RinE1+ | Receiver Signal (+) |
| 17 | VSS | Ground |
| 18 | RinE2- | Receiver Signal (-) |
| 19 | RinE2+ | Receiver Signal (+) |
| 20 | RinEC- | Clock Signal (-) |
| 21 | RinEC+ | Clock Signal (+) |
| 22 | RinE3- | Receiver Signal (-) |
| 23 | RinE3+ | Receiver Signal (+) |
| 24 | VSS | Ground |
| 25 | NC | NC |
| 26 | NC | GND |
| 27 | NC | GND |
| 28 | VDD+5V | Power Supply, 5V (Typical) |
| 29 | VDD+5V | Power Supply, 5V (Typical) |
| 30 | VDD+5V | Power Supply, 5V (Typical) |

5.2 Back Light Unit (CCFL) Connectors:

CN2, 3, 4, 5: CCFL Power Source (Yeonho 35001H5-02 or equivalent)

| Pin No. | Symbol | Color | Function |
|---------|--------|-------|----------------------------------|
| 1 | Hot1 | Pink | CCFL power supply (High voltage) |
| 2 | Cold1 | White | Ground |

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6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module:

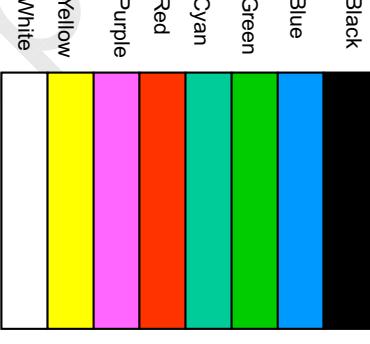
| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------|------------|-------|-------|------|------|------|
| Voltage of power supply | V_{DD} | 4.5 | 5.0 | 5.5 | V | |
| Current of power supply | I_{DD0} | 595 | 695 | 795 | | (1) |
| | I_{DD1} | 720 | 870 | 1020 | mA | (1) |
| | I_{DD2} | 960 | 1160 | 1360 | mA | (1) |
| Vsync frequency | f_V | 56 | 60 | 75 | Hz | (2) |
| Hsync frequency | f_H | 60.5 | 64.8 | 82.4 | KHz | |
| Frequency | f_{DCLK} | 55.64 | 59.61 | 82 | MHz | |
| Input rush current | I_{RUSH} | --- | --- | 2 | A | (3) |

Note (1)

(a) White: I_{DD0}



(b) V- Color: I_{DD1}

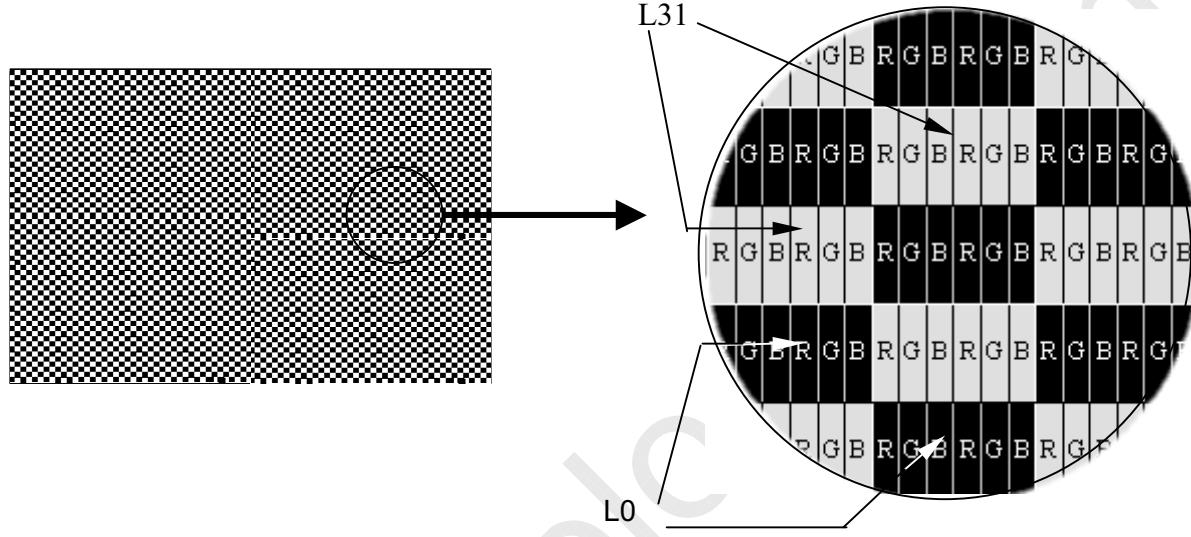


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(c) Mosaic: I_{DD2} 

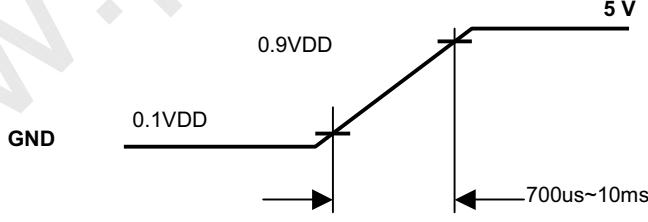
Grey scale: L0~L255

L0: Luminance with all pixels black.

L255: Luminance with all pixels white.

Note (2) When f_V is too low, a flicker may be occurred on the display.

Note (3) Input Rush Current condition



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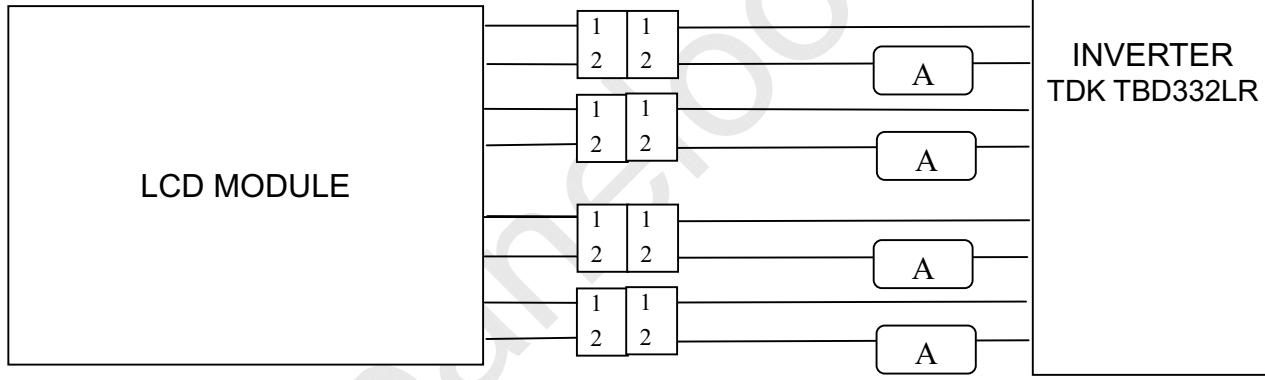
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6.2 Back-Light Unit

The back-light system is an direct-lighting type with 4CCFLs (Cold Cathode Fluorescent Lamp). The characteristics of the lamp are shown in the following tables.

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------|--------|--------|------|------|---------|------------------------|
| Lamp current | IL | 3.0 | 7.5 | 9.0 | mA(rms) | (1) |
| Lamp voltage | VL | - | 730 | - | V(rms) | $I_L = 7.5 \text{ mA}$ |
| Frequency | fL | 40 | 50 | 80 | KHz | (2) |
| Operating Lifetime | Hr | 40,000 | -- | -- | Hour | 7.5mA(3) |
| Startup voltage | Vs | 1650 | -- | -- | V(rms) | at 25°C |
| | | 1850 | | | | at 0°C |



Note (1)

Lamp current is measured with current meter for high frequency as shown below. Specified values are for a single lamp. To exceed 7.5 mA, life time accelerate drop down and if to exceed 9.0 mA has safety problem. If current lower than 3.5 mA, CCFL would be unstable or damaged.

Note (2)

Lamp frequency may produce interference with horizontal synchronous frequency and this may cause ripple noise on the display. Therefore lamp frequency shall be kept away from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note (3)

Lamp life time (Hr) can be defined as the time in which it continues to operate under the condition : $T_a=25\pm3^\circ\text{C}$, Typical IL value indicated in the above table and $f_L=48 \text{ kHz}$ until the brightness becomes less than 50%



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Note (4)

CCFL inverter should be able to provide a voltage over specified value (Vs) in the above table. Lamp units need at least Vs value shown above to ignition.

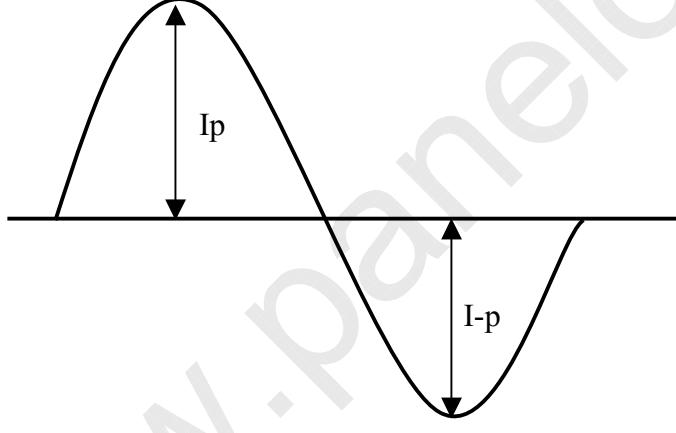
Note (5)

The voltage over specified value (Vs) should be applied to the lamp more than 1 second after startup. Otherwise, the lamp may not be turned on. The used lamp current is the lamp typical current.

Note (6)

The output voltage waveform and current waveform of the inverter must be symmetrical (Unsymmetrical ratio is less than 10%). Please do not use the inverter which has unsymmetrical voltage and current waveform, and spike waveform. The inverter design which can provide the best optical performance, power efficiency, and lamp life should under the following conditions.

- The asymmetry rate of the inverter waveform should be less than 10%.
- The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$.
- The inverter output waveform should be better similar to the ideal sine wave.



$$\text{Asymmetry rate} = |I_p - I_{-p}| / I_{rms} \times 100\%$$

$$\text{Distortion rate} = I_p \text{ (or } I_{-p}) / I_{rms}$$



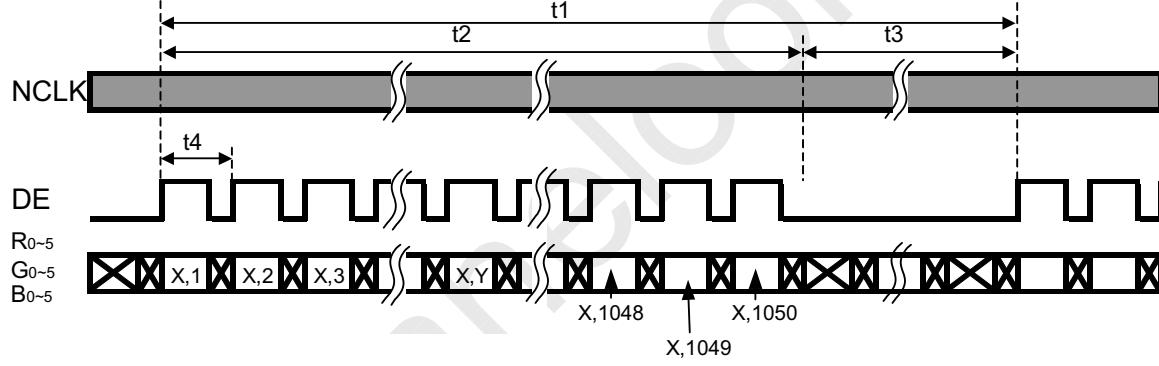
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6.3 Interface Timing (DE mode)

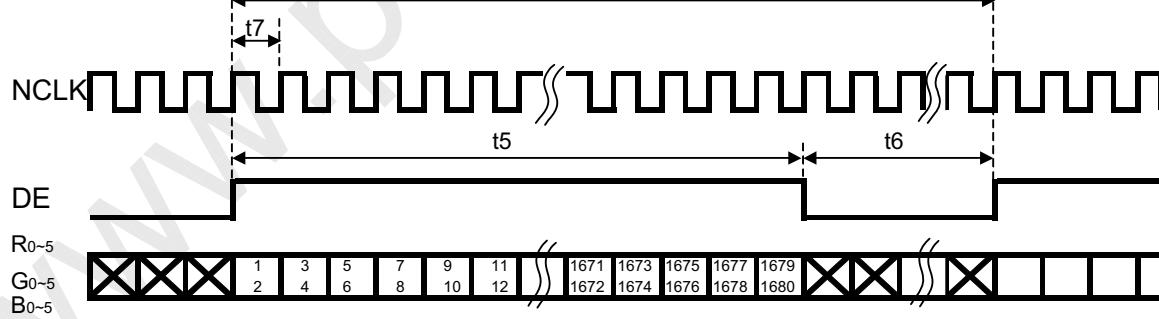
| Item | Symbol | Min. | Typ. | Max. | Unit |
|--------------------------|--------|-------|-------|------|-------|
| Frame Rate | -- | 60 | 60 | - | Hz |
| Frame Period | t1 | - | 1080 | 1099 | line |
| Vertical Display Time | t2 | - | 1050 | - | line |
| Vertical Blanking Time | t3 | - | 30 | 49 | line |
| 1 Line Scanning Time | t4 | - | 920 | 1136 | clock |
| Horizontal Display Time | t5 | - | 840 | - | clock |
| Horizontal Blanking Time | t6 | - | 80 | 296 | clock |
| Clock Rate | t7 | 59.61 | 59.61 | 82 | MHz |

Timing Diagram of Interface Signal (DE mode)

(1) Vertical



(2) Horizontal

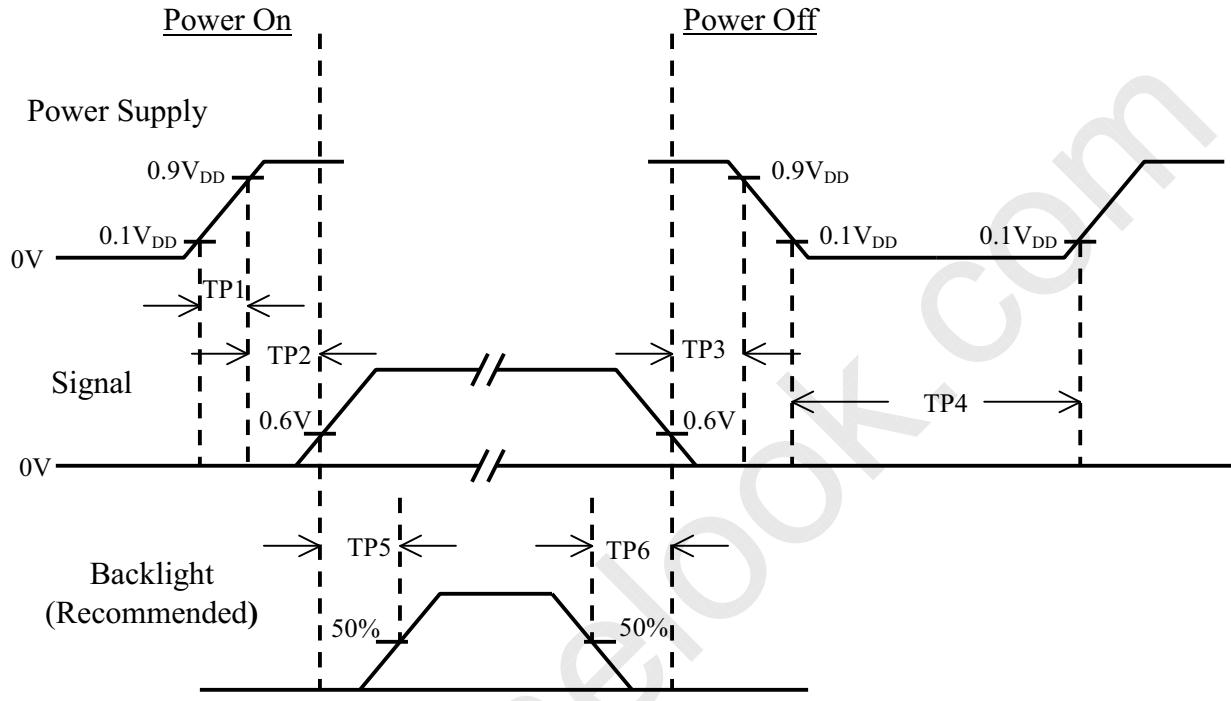




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6.4 Power On / Off Sequence :



| Item | Min. | Typ. | Max. | Unit | Remark |
|------|------|------|------|------|--------|
| TP1 | 0.5 | -- | 10 | msec | |
| TP2 | 0 | -- | 50 | msec | |
| TP3 | 0 | -- | 50 | msec | |
| TP4 | 500 | -- | -- | msec | |
| TP5 | 200 | -- | -- | msec | |
| TP6 | 200 | -- | -- | msec | |

Note : (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD} .

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of V_{DD} = off level, please keep the level of input signal on the low or keep a high impedance.

(4) TP4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

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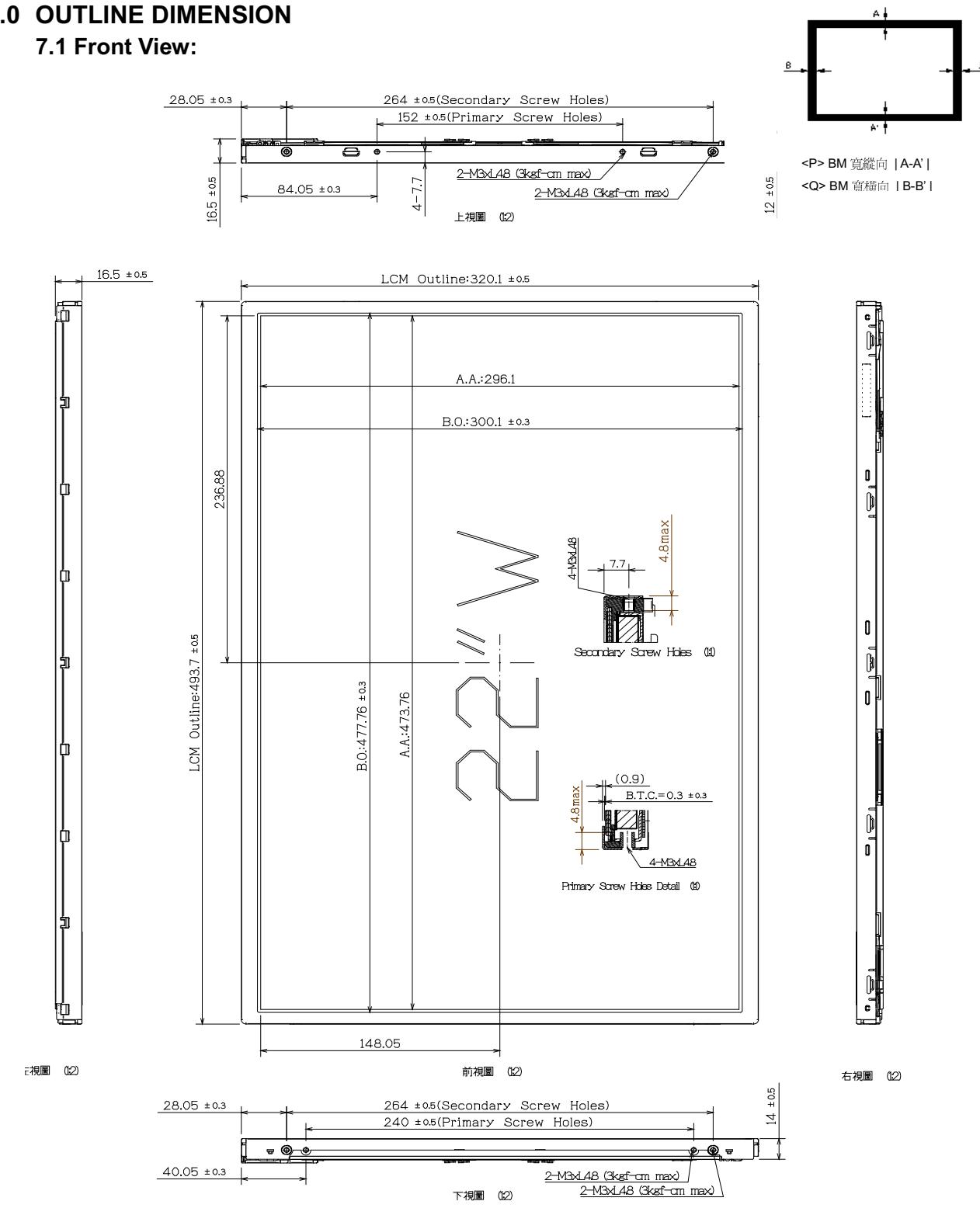


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7.0 OUTLINE DIMENSION

7.1 Front View:



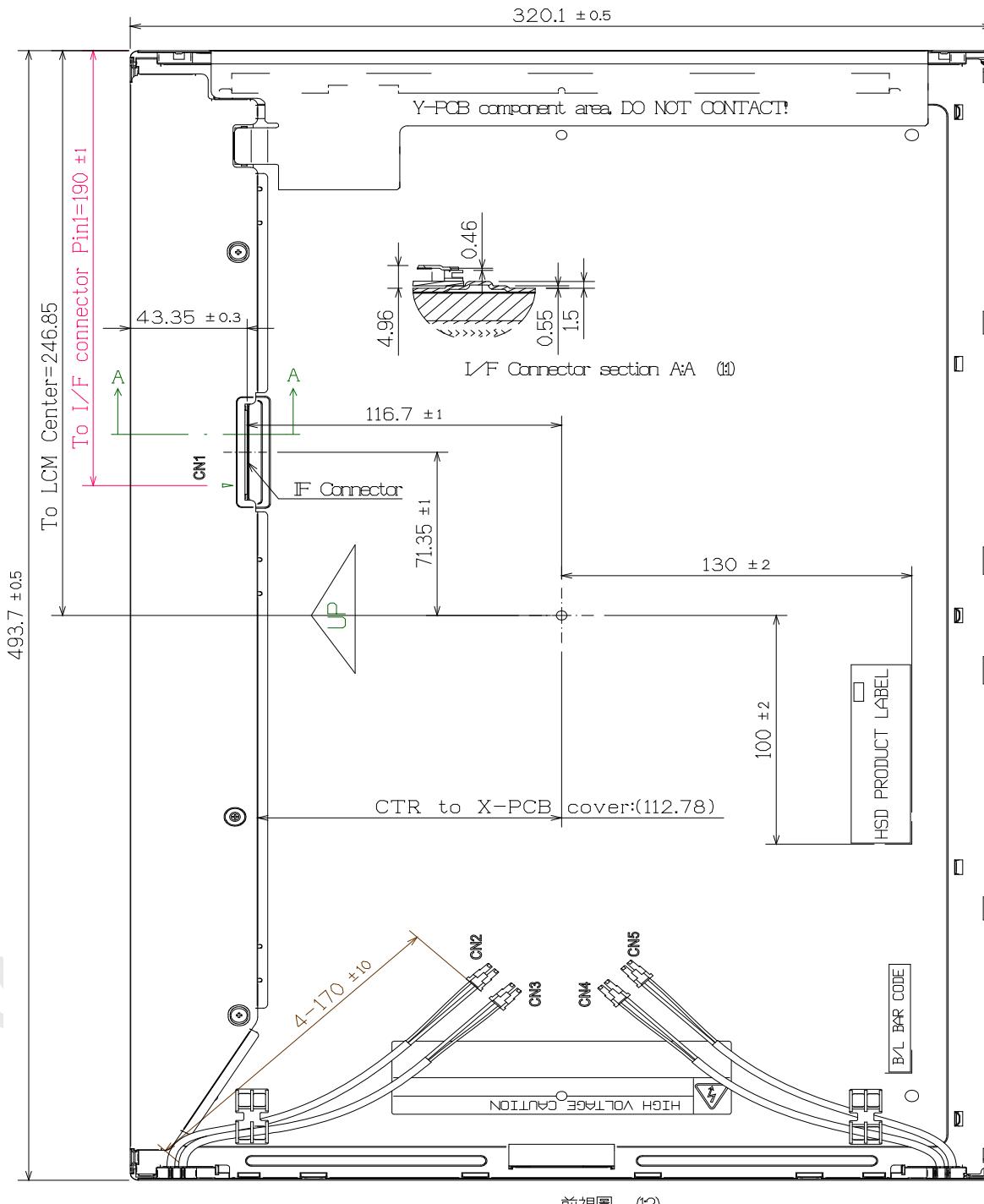
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7.2 Back View:



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8.0 LOT MARK

8.1 Lot Mark

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|

code 1,2,3,4,5,6: HannStar internal flow control code.

code 7: production location.

code 8: production year.

code 9: production month.

code 10,11,12,13,14,15: serial number.

Note (1) Production Year

| | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| Year | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| Mark | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

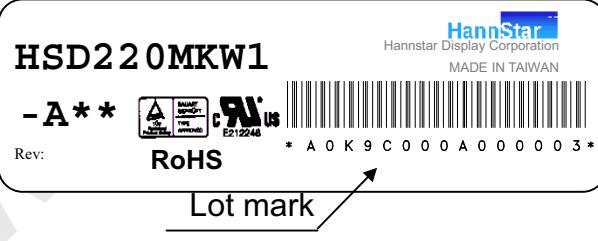
Note (2) Production Month

| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| Month | Jan. | Feb. | Mar. | Apr. | May. | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. |
| Mark | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

8.2 Location of Lot Mark

(1) The label is attached to the backside of the LCD module.

(2) This is subject to change without prior notice.



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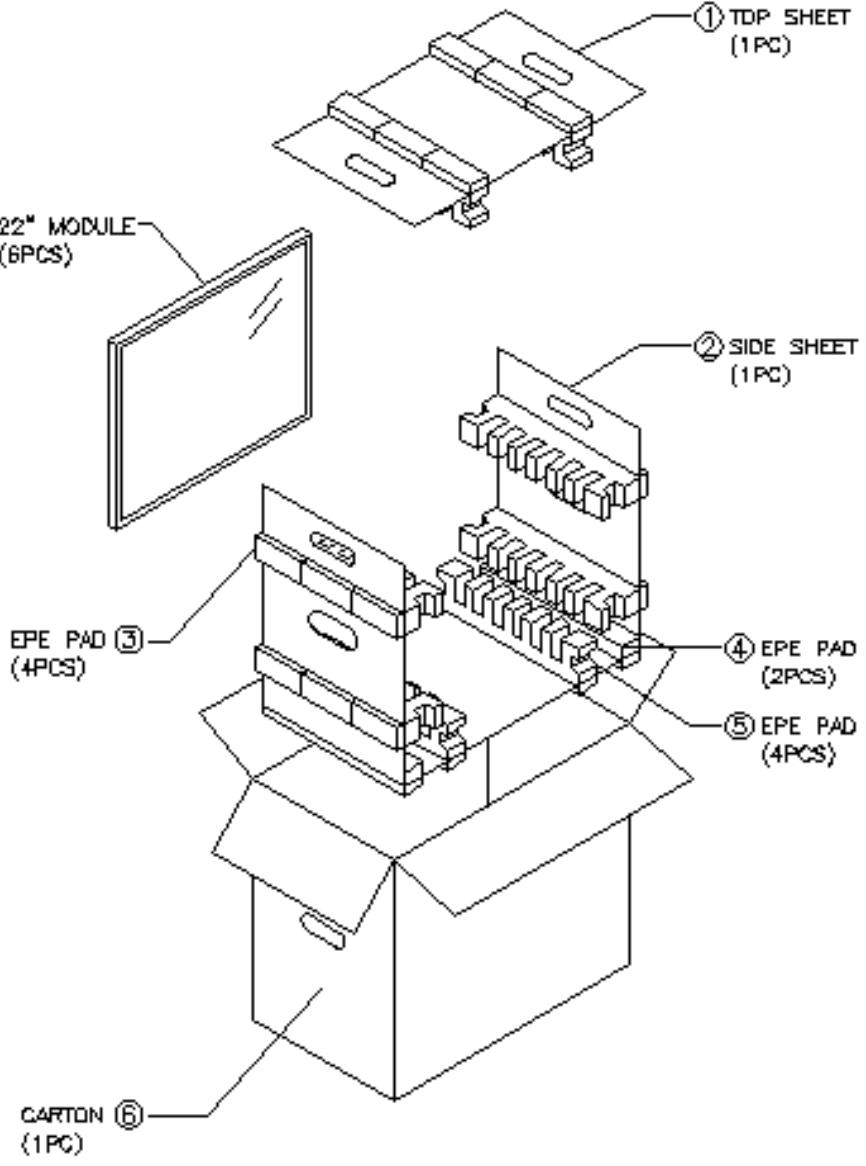
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9.0 PACKAGE SPECIFICATION

9.1 Packing form

- (1) Package quantity in one carton: 6 pieces
- (2) Carton size: 600 x 267 x 440_H (mm)

9.2 Packing assembly drawings



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10.0 GENERAL PRECAUTION

10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

10.3 Breakage of LCD Panel

- 10.3.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 10.3.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 10.3.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 10.3.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

10.4 Electric Shock

- 10.4.1 Disconnect power supply before handling LCD module.
- 10.4.2 Do not pull or fold the CCFL cable.
- 10.4.3 Do not touch the parts inside LCD modules and the fluorescent lamp's connector or cables in order to prevent electric shock.

10.5 Absolute Maximum Ratings and Power Protection Circuit

- 10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 10.5.3 It's recommended employing protection circuit for power supply.

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10.6 Operation

- 10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
Use fingerstalls of soft gloves in order to keep clean display quality, when Persons handle the LCD module for incoming inspection or assembly.
- 10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 10.6.3 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
- 10.6.4 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

10.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

10.8 Static Electricity

- 10.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- 10.8.2 Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.
- 10.8.3 Persons who handle the module should be grounded through adequate methods.

10.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

10.10 Disposal

When disposing LCD module, obey the local environmental regulations.